WIND ENERGY

RENEWABLE ENERGY PROGRAM

CALIFORNIA ENERGY COMMISSION

Wind is the response of the atmosphere to uneven heating conditions on the earth. This creates pressure differences in the atmosphere, causing wind to blow from regions of high atmospheric pressure to low atmospheric pressure. The larger the pressure difference, the greater the wind velocity or speed. Wind is moving air and the sun is what drives it. Humans have been harnessing the wind throughout the world for hundreds of years, usually for pumping water or mechanical work such as milling grain. Today, the wind has become a source of clean, free fuel for advanced wind turbines and is increasingly becoming the most utilized renewable energy source in the world.

Modern wind turbines can even produce electricty in winds that are less than 10 miles per hour (mph). However, the stronger the wind, the more energy it contains. The power available in the wind is proportional to the cube of its speed. That means if the wind doubles from 10 to 20 mph, the power output from a wind generator should increase by a factor of 8, (i.e., from 100 watts to 800 watts). Stronger winds are found higher above the earth. This corresponds to the height of the modern wind turbines, some of which can be as tall as 200 feet. On average, increasing the height by a factor of five, say raising the height of the wind turbine from 10 to 50 feet, will result in twice as much available wind power. That is why wind turbines are perched on tall towers and are often located on hilltops or mountains. Air temperature is also an important factor in wind power generation. Cold air is more dense than hot air, and wind turbines are able to generate about 5% more power at any given wind speed in the winter than in the summer.

The newest class of wind turbines can generate electricity for less than 4 cents per kilowatt hour. That is cheaper than electricity from new coal-fired power plants. Electric utilities are turning to wind power because of its attractive economics. Wind turbines have relatively low initial costs and since they require no fuel and produce no polluting air emissions, they are cheap to operate and are now economically available for powering homes and small businesses. Residents in all 50 states and many other countries have been installing small-scale wind generation systems to generate their own clean, reliable renewable energy.

Wind turbines operate most efficiently, are best located and can compete on a cost basis with fossil fuel electricity-generating technologies where winds are at least 17 mph or greater. At these sites, windfarms are created and can have as many as 5000 single wind turbines harvesting the free energy contained in the wind. The windfarm at Altamont Pass near Stockton, California is just one example of a working windfarm. California generated 1620 megawatt of wind power in 1999. That is 65 percent of all the wind power in the U.S. and 12 percent of the world wind power output.

For more information, contact the California Energy Commission Call Center at **1-800-555-7794** or visit our Web Site at:
www.energy.ca.gov/renewables

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